

Instruction Book
and
List of Parts

FOR
THERMOIL
KEROSENE
ENGINES

--T--

Be sure to give engine number and horse-power
when ordering repairs.

Do Not Use Gasoline in This Engine

Do not return any parts of your engine to us unless
we ask you to do so. Write us first for information;
by doing this you will obtain quicker service.

DO NOT USE GASOLINE IN THIS ENGINE.

This engine will start and run on kerosene, distillate, tops or fuel oil, but it will not operate on gasoline.

You must not, under any circumstances, try to use gasoline as fuel.

HOW TO OPERATE A THERMOIL ENGINE.

Thermoil Engines are so simple in construction and so easy to start that there are only a few things to do after the engine has been uncrated.

It is necessary that you have the engine ready to run before you try to start it, and by carefully following the instructions given below, you will find that the Thermoil Engine will start every time you try it.

FIRST: Uncrate the engine, taking the fuel tank out of the base and the equipment out of the water reservoir. Fill the grease cups with the grease that we furnish, and screw them into the main bearings and connecting rod bearing, in place of the wooden plugs. Turn the main bearing grease cups three full turns to the right and adjust the one on the connecting rod, as follows: For Summer use, cut down the amount of grease by turning the screw in the shank of the cup until the hole in bottom of the cup is half closed; fill cup and before placing on the engine see how fast it feeds. A cup full of grease should last half a day. For Winter use, the hole in the bottom of the cup should be wide open. Adjust the screw in the shank of the cup until it feeds the proper amount of grease for this bearing.

SECOND: Put the fuel tank in place, as shown in the illustration on opposite page. Connect the fuel pipe from the tank to the fuel cock "D" and be sure all joints are drawn up tight so they will not leak.

THIRD: Place the lubricator "I" (see opposite page) in its place and fill it with lubricating oil like the sample we furnish. Raise the lever "J" on top of the lubricator, which allows the oil to feed. Adjust the lubricator by turning the knurled nut just under the lever "F" to the right or left, as necessary. To decrease the feed or flow of oil, turn the knurled nut to the left. To increase the flow of oil, turn the knurled nut to the right. After lubricator is adjusted, close it by pushing down the lever "F."

ADJUST LUBRICATOR ACCORDING TO THE FOLLOWING:

Horse-Power	On Full Load	On Light Load
1½ and 2½	25 drops per minute	15 drops per minute
3 and 7	40 drops per minute	25 drops per minute

NEVER USE STEAM ENGINE OIL IN THE LUBRICATOR, OR AXLE GREASE IN THE GREASE CUPS. USE THE BEST GRADES OF OIL AND GREASE SIMILAR TO SAMPLES FURNISHED WITH ENGINE.

FOURTH: Oil all movable parts with the same kind of oil as you use in the lubricator. There are a number of small oil holes and oil cups that should be well oiled. Push several times, the intake valve "N" and the exhaust valve "M," located in the head of the cylinder, to see that they work freely, and oil the stems, also valves "J" and "K." See that the governor works freely by taking the governor balls and pulling them apart, working them back and forth several times, after having oiled all the parts thoroughly.

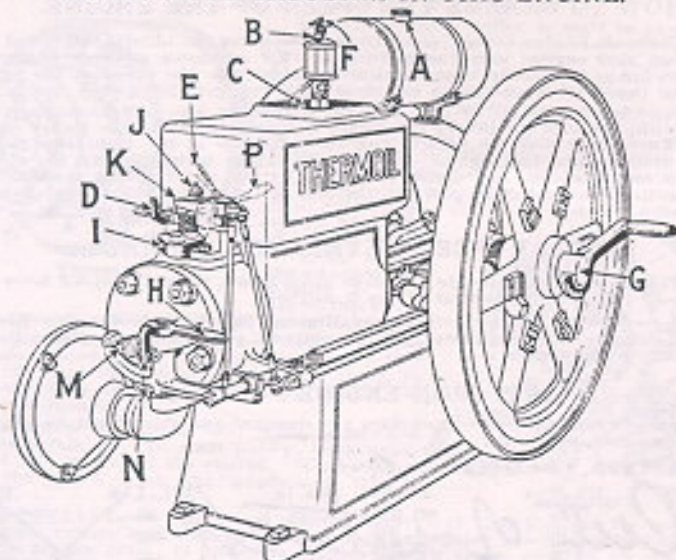
FIFTH: Place the starting crank on the shaft marked "G," as shown in illustration on opposite page. With the left hand open the intake valve "N" by pushing out on lever "H," and with the right hand on the crank, turn the flywheel around several times to see that all parts are operating freely.

SIXTH: Fill the tank "A" with **CLEAN KEROSENE**. Always strain your kerosene in putting it into the tank. It is also important to clean the strainer on bottom of fuel tank.

SEVENTH: Fill the water reservoir "C" with clean warm water.

THE ENGINE IS NOW READY TO BE STARTED.

DO NOT USE GASOLINE IN THIS ENGINE.



HOW TO START THE ENGINE.

FIRST: Turn flywheels until piston is at the open end of cylinder. Put the starting crank on crankshaft "G," turn on lubricator by raising lever "F."

SECOND: Turn handle of shut off cock "D" so it is parallel with the pipe.

THIRD: Push speed lever "E" over to the left as far as it will go.

FOURTH: Hold intake valve "N" open with left hand by pushing out on lever "H." Take hold of starting crank with right hand and turn flywheels around until you have them spinning; then release intake valve by letting go of lever "H"; continue to turn engine over compression two or three times and it will start.

If the engine fails to start, open intake valve by pushing out on lever "H," turn flywheels around until the piston is at the open end of the cylinder, place crank on the shaft "G." Then press down valve "K" until the fuel runs out of small hole marked "J." This primes the engine. Repeat the cranking operation explained above, and the engine will start. During cold weather, pour warm water in water reservoir before starting engine. Don't use hot water, as it may crack the cylinder.

When priming engine, if you should get a little too much fuel in the cylinder, there will be a slight knocking until the surplus oil has been used up. [The engine will also pound or knock if you overload it.] Your engine may smoke a little after starting, but when it warms up, this will stop.

TO START THE ENGINE WHEN IT IS HOT.

Engage starter crank as shown in illustration above; open fuel cock "D" and press down once quickly on fuel valve "K," and then close fuel cock "D," and start the engine. As soon as the engine starts, open fuel cock "D." Too much fuel will make the engine knock.

TO STOP THE ENGINE.

Close the shut off cock "D" by raising the handle to a vertical position, and shut off the oil by pushing down lever "F."

In cold weather when shutting down for more than one hour, open the drain cocks underneath the cylinder and the cylinder head to drain the water so it will not freeze.

HOW TO CHANGE THE SPEED OF THE ENGINE.

The Thermoil Engine is equipped with a speed lever; to obtain full speed and power from your engine, have the speed lever "E," as shown on page 3, over to the left as far as it will go. You can gradually decrease the speed of the engine by moving the speed lever "E" to the right until you get the desired speed.

The machines you want to run with the engine, to give satisfactory service, must be equipped with the proper size pulley to correspond with the pulley on the engine. To be sure that the pulleys you are using are of the right size to give the best results, take the regular speed of the engine multiplied by the size of the pulley on the engine and divide the result by the speed of the machine you want to run. The result will give you the size of the pulley you should have on the machine.

REGULAR SPEED OF THERMOIL ENGINES.

The Thermoil Engines operate at speeds given below, when the speed lever "E" (see page 3) is over to the left as far as it will go:

1½ Horse-Power, 575 Revolutions per Minute, 2½ Horse-Power, 500 Revolutions per Minute, 5 Horse-Power, 450 Revolutions per Minute, 7 Horse-Power, 375 revolutions per minute.

CAST IRON ENGINE PULLEYS.

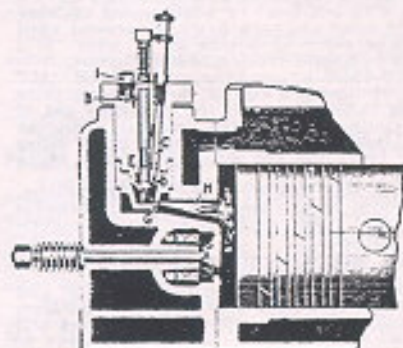
The pulleys furnished on our engines are standard and should not be changed unless absolutely necessary.

No. 47T330 Cast Iron Engine Pulleys.

Size, In.	Wt. Lbs.	Price	Size, In.	Wt. Lbs.	Price
4x4	30	80.95	20x8	85	5.60
8x4	16	1.70	20x8	86	6.20
12x6	22	2.40	20x8	102	3.40
16x6	29	3.40			

It is not advisable to use a pulley any larger than 12x6 inches on the 1½ horse-power; 16x6 inches on the 2½ or 5 horse-power; 20x8 inches on the 7 horse-power.

HOW THE THERMOIL KEROSENE ENGINE OPERATES.



above that in the cylinder and forces the surplus air out through the holes "G" in the form of spray as indicated by "H," which, on coming in contact with the red hot compressed air in the cylinder, is heated and burns; the resulting pressure (commonly called an explosion) forcing the piston out on the third or expansion stroke.

FOURTH: As the piston reaches the outer end of the expansion stroke, the exhaust valve (which is not shown in the illustration) is opened mechanically, and the piston, traveling back on the return or exhaust stroke, forces the burnt gas out through the muffler, which completes the operation.

Thermoil Kerosene Engines operate on the four-cycle principle, the same as our Economy Gasoline Engines, and have the same four strokes—suction, compression, expansion and exhaust.

FIRST: On the first or suction stroke, pure air only (no fuel) is drawn into the cylinder through intake valve "A." The fuel is admitted by gravity through the fuel pipe "B" into passage "C," where it flows down around the needle valve stem "C." This needle valve is raised and lowered by the action of the governor and controls the amount of fuel that is admitted to the passage "D." During part of the suction stroke, valve "E" is opened mechanically and the fuel runs into the fuel cup "F," which is connected with the main cylinder by small holes "G."

SECOND: On the second or compression stroke, the air previously admitted to the cylinder is compressed to about 450 pounds per square inch, which heats it to about 1,000 degrees Fahrenheit, or until it is what you might call red hot.

THIRD: As the temperature of the air in the cylinder rises, due to compression, the small amount of air in the fuel cup "F" gets red hot and sets fire to the fuel in the cup. As this fuel burns, the pressure within the cup rises

FRICITION CLUTCH PULLEYS.

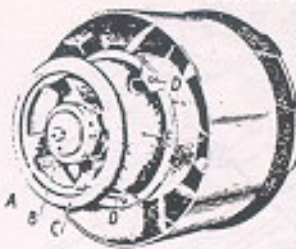


Figure 6.

This releases pulley "H," so it can be taken off.

To put on the new pulley you simply reverse the above operations. Be sure the screws "P" and "D" and the cap screw "A" are tight, to prevent them from working loose while the pulley is running.

The pulley will stand still when handwheel "C" is pulled out. To start pulley, push handwheel "C" in toward the engine. When engaging the clutch push the handwheel "C" in slowly.

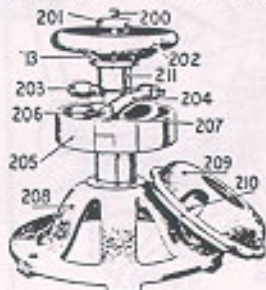
IMPORTANT—Be sure to oil clutch pulley every time you run the engine. To oil clutch remove iron plug in pulley hub; use regular gasoline engine oil and be sure to replace plug. If pulley is furnished with grease cup, fill grease cup and turn down top one-half turn every time you run the engine.



Figure 7.

CLUTCH PULLEY PARTS.

Be sure when ordering parts for clutch to give size of handwheel, diameter and face of pulley and horse-power of engine.



Part No.	Description
*47T200	Belt
*47T201	Washer
*47T202	Handwheel
*47T203	Adjusting Screw
*47T204	Clutch Dog, each
x47T205	Friction
*47T206	Locknut
*47T207	Nut
x47T208	Pulley Frame
*47T209	Clutch Cover
*47T210	Set of 3 Screws
*47T211	Cap
x47T212	Pulley Shaft
*47T213	Threaded Clutch Collar
*47T214	Shaft Set Screws
*47T215	Key for Pulley

*When ordering friction, be sure to give diameter of 44 friction.

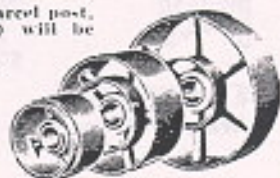
NOTE—All parts marked (*) will be shipped by parcel post, postage paid, at prices shown. Parts marked (x) will be shipped by express collect.

No. 47T329 CLUTCH PULLEY RIMS ONLY:

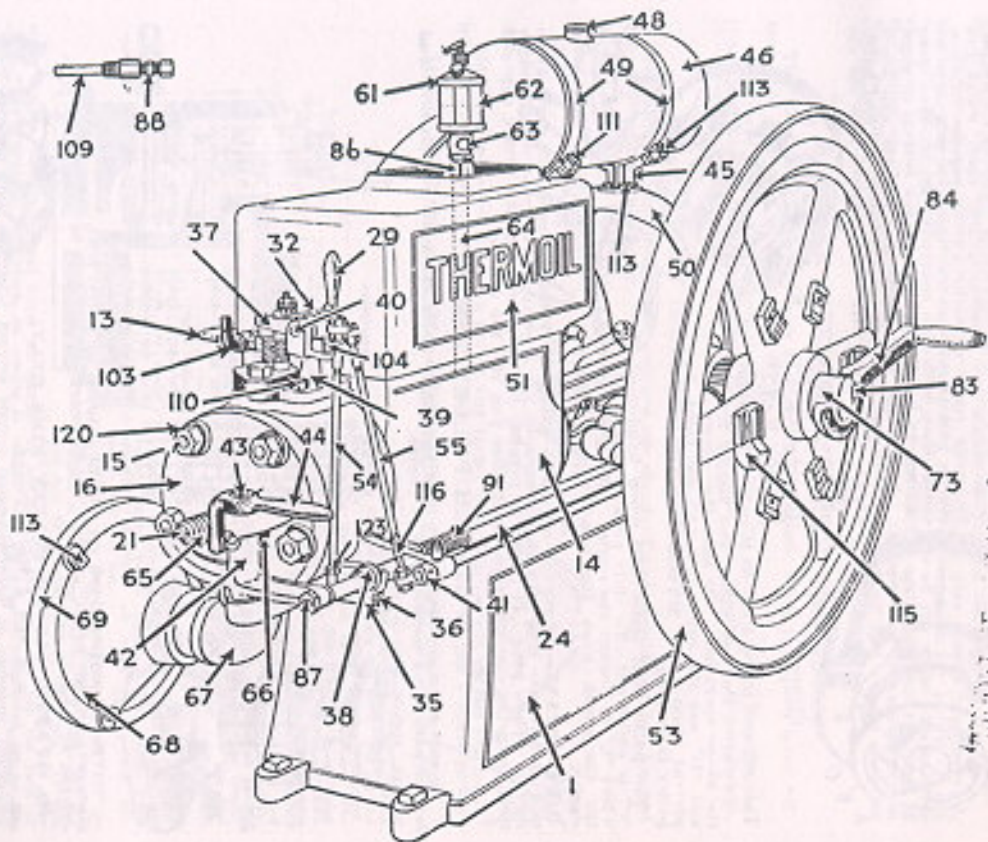
Sizes 3 and 7 Horse-Power.

Size, Inches	Weight
8x4 Rim	15 pounds
12x6 Rim	24 pounds
16x6 Rim	45 pounds

Shipped by express from factory in OHIO.

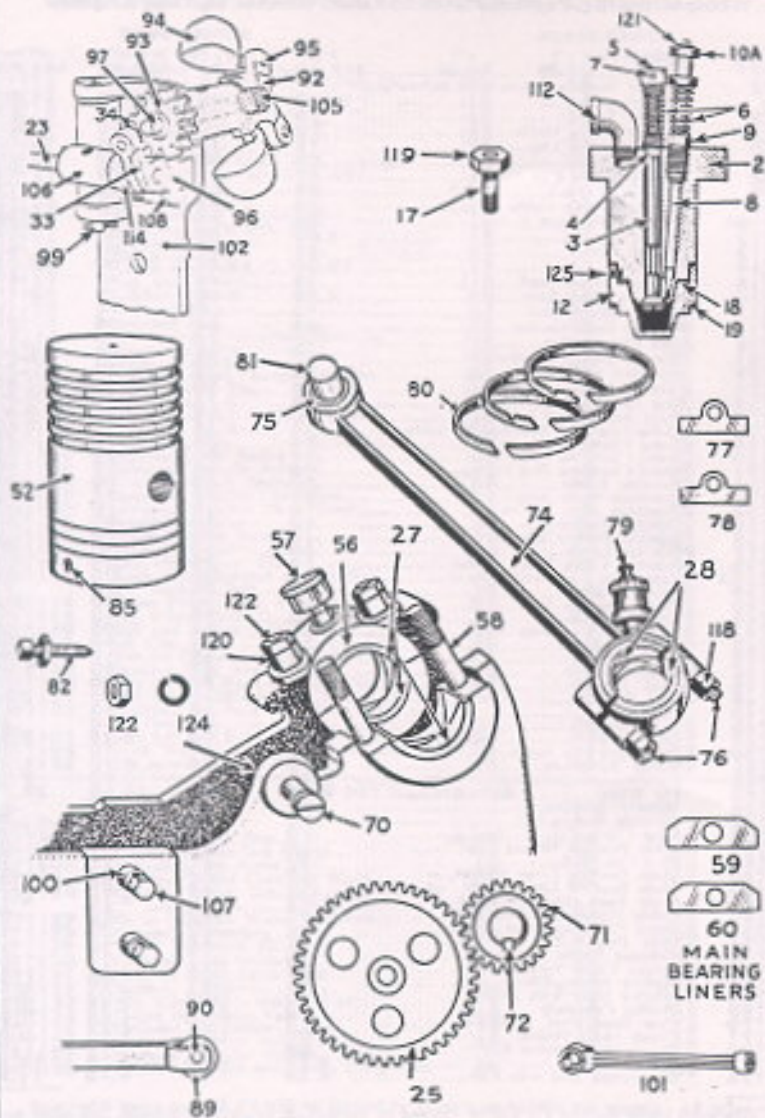


When Ordering Parts Be Sure to Give the Number of Your Engine.



Prices Quoted in This Price List Are
Subject to Change Without Notice.

When Ordering Parts Be Sure to Give Number of Your Engine.



For List of Parts See Next Two Pages.

When Ordering Parts Be Sure to Give Number of Your Engine.

HORSE-POWER

Part No.	Name of Part	1 ¹ / ₂	2 ¹ / ₂	5	7
47T1	Base	\$17.00	\$17.75	\$26.65	\$40.75
47T2	Injector Body complete with valves and strings	14.60	14.60	14.60	14.60
47T3	Injector Valve	.75	.75	.75	.75
47T4	Injector Valve Guide	.20	.20	.20	.20
47T5	Injector Valve Cap	.15	.15	.15	.15
47T6	Valve Spring	.08	.08	.08	.08
47T7	Injector Valve Cap Pin	.05	.05	.05	.05
47T8	Throttle Valve	.25	.25	.25	.25
47T9	Throttle Valve Guide	.35	.35	.35	.35
47T10A	Throttle Nut and Collar	.20	.20	.20	.20
47T12	Fuel Cup	1.00	1.00	1.00	1.00
47T13	Supply Pipe	.52	.60	.60	.65
47T14	Cylinder	12.00	12.75	17.00	23.25
47T15	Cylinder Head Stud	.35	.45	.45	.60
47T16	Cylinder Head, only	4.45	9.00	12.10	13.75
47T17	Injector Body Stud	.10	.10	.10	.10
47T18	Injector Body Gasket	.06	.06	.06	.06
47T19	Fuel Cup Gasket	.10	.10	.10	.10
47T21	Inlet or Exhaust Valve	.40	.40	.40	.40
47T23	Governor Shaft	.20	.25	.30	.35
47T24	Cam Rod	.20	.25	.30	.35
47T25	Cam Gear	1.20	1.20	1.20	1.20
47T27	Main Bearing (2 halves)	1.10	1.10	1.10	1.10
47T28	Connecting Rod Bearings (2 halves)	.75	.75	.75	.75
47T29	Speed Changing Lever	.06	.06	.06	.06
47T30	Speed Changing Box	.06	.06	.06	.06
47T31	Speed Changing Dog Spring	.06	.06	.06	.06
47T32	Throttle Lever	.50	.50	.50	.50
47T33	Governor Shaft Arm	.25	.25	.25	.25
47T34	Governor Arm Button	1.00	1.00	1.00	1.00
47T35	Injector Rocker	.50	.50	.50	.50
47T36	Injector Rocker Pin	.10	.10	.10	.10
47T37	Injector Lever	.50	.50	.50	.50
47T38	Injector Valve Drive Collar	.50	.50	.50	.50
47T39A	Lever Pin for above Collars	.06	.06	.06	.06
47T40	Lever Bracket	.70	.70	.70	.70
47T41	Lever Bracket Pin	1.00	1.00	1.00	1.00
47T41A	Throttle Arm	.40	.40	.40	.40
47T42A	Lever Pin for above Arm	.06	.06	.06	.06
47T42	Exhaust Lever	.30	.30	.30	.30
47T43	Lever Pin	.15	.15	.15	.15
47T44	Release Lever	.35	.35	.35	.35
47T45	Tank Bracket	.60	.60	.60	.60
47T46	Fuel Tank	2.35	3.10	3.10	3.70
47T47	Filler Cap	.40	.40	.40	.40
47T48	Tank Strap	.40	.40	.40	.40
47T50A	Oil Guard	1.10	1.30	2.00	2.20
47T51	Oil Guard Cap Screw	.10	.10	.10	.10
47T52	Water Reservoir	6.25	6.85	9.70	14.55
47T53	Piston	2.20	4.45	5.70	7.75
47T54	Fly Wheel	2.20	12.00	19.50	27.75
47T55	Injector Rod	.22	.22	.22	.22
47T56	Throttle Rod	.22	.22	.22	.22
47T57	Base Cap	.70	1.00	1.00	1.00
47T58	Main Bearing Grease Cup	.35	.35	.35	.35
47T59	Base Cap Stud	.10	.10	.10	.10
47T60	Main Bearing Liner (thick), set	.10	.10	.10	.10
47T61	Main Bearing Liner (thin), set	.10	.10	.10	.10
47T62	Night Feed Oiler, complete	1.95	2.00	2.00	2.00
47T63	Large Glass for Oiler	.10	.10	.10	.10
47T64	Small Glass for Oiler	.30	.30	.30	.30
47T65	Oiler Plug	.20	.20	.20	.20
47T66	Exhaust Valve Spring	.15	.15	.15	.15
47T67	Intake Valve Spring	.15	.15	.15	.15
47T68	Muffler Street Elbow	.25	.40	.40	.40
47T69	Muffler Body with Stud	1.00	1.65	2.00	2.20
47T70	Muffler Cap, only	.60	.65	.65	.65
47T71	Cam Gear Stud, complete	.15	.15	.15	.15
47T72	Crank Shaft Pinion	1.00	1.00	1.00	1.00
47T73	Crank Shaft Pinion Key	.09	.09	.09	.09
47T74	Crank Shaft	6.25	7.50	14.70	17.50
47T75	Connecting Rod with Cap	4.50	7.50	9.75	11.75

Note:—All items marked (A) will be shipped by express or freight, not prepaid. All other parts are shipped by parcel post, postage paid by us.

When Ordering Parts Be Sure to Give Number of Your Engine.

Part No.	Name of Part	HORSE-POWER			
		1 1/2	2 1/2	5	7
477175	Connecting Rod Bushing.....	50.45	50.00	51.20	51.75
477176	Connecting Rod Bolt with Cotter Pin.....	3.65	3.65	3.65	3.65
477177	Connecting Rod Liner (thick), set.....	1.15	1.15	1.15	1.15
477178	Connecting Rod Liner (thin), set.....	1.15	1.15	1.15	1.15
477179	Connecting Rod Grease Cup.....	3.35	3.35	3.35	3.35
477180	Piston Ring.....	53.85	53.85	53.85	53.85
477181	Piston Pin.....	7.20	7.20	7.20	7.20
477182	Piston Pin Set Screw with Locknut.....	0.06	0.06	0.06	0.06
477183	Fly Wheel Key (governor side).....	1.25	1.25	1.25	1.25
477184	Starting Crank.....	1.00	1.00	1.00	1.00
477185	Piston Oil Tube.....	3.55	3.55	3.55	3.55
477186	Oiler Reducing Coupling.....	1.15	1.15	1.15	1.15
477187	Adjusting Screw with Nut.....	3.30	3.30	3.30	3.30
477188	Straight Connection.....	3.30	3.30	3.30	3.30
477189	Cam Roller.....	1.25	1.25	1.25	1.25
477190	Cam Roller Pin.....	1.15	1.15	1.15	1.15
477191	Cam Rod Spring.....	1.15	1.15	1.15	1.15
477192	Governor Spindle.....	1.40	1.40	1.40	1.40
477193	Governor Pinion.....	5.55	5.55	5.55	5.55
477194	Governor Ball.....	2.55	2.55	2.55	2.55
477195	Governor Ball Pin with Cotter.....	0.05	0.05	0.05	0.05
477196	Governor Bracket Plate.....	3.20	3.20	3.20	3.20
477197	Governor Spindle Rod.....	1.40	1.40	1.40	1.40
477198	Governor Lever Changing Washer.....	0.05	0.05	0.05	0.05
477199	Governor Lever Pin.....	0.05	0.05	0.05	0.05
477100	Wrench for Wrist Pin Set Screw.....	1.30	1.30	1.30	1.30
477101	Governor Bracket.....	1.05	1.05	1.05	1.05
477102	Shut Off Cock.....	1.30	1.30	1.30	1.30
477103	Injector Lever Spring.....	0.05	0.05	0.05	0.05
477104	Governor Spindle Spring.....	2.25	2.25	2.25	2.25
477105	Governor Shaft Bracket.....	2.25	2.25	2.25	2.25
477106	Governor Bracket Cap Screw.....	0.05	0.05	0.05	0.05
477107	Governor Bracket Plate Screw.....	1.10	1.10	1.10	1.10
477108	Strainer Bushing.....	0.05	0.05	0.05	0.05
477109	Lever Bracket Screw.....	0.05	0.05	0.05	0.05
477110	Tank Cap Screw.....	0.05	0.05	0.05	0.05
477111	Fuel Pipe Street Elbow.....	0.05	0.05	0.05	0.05
477112	Tank Strap Bracket and Muffler.....	0.05	0.05	0.05	0.05
477113	Machine Bolt.....	.10	.10	.10	.10
477114	Taper Pin for Gov. Shaft Arm.....	0.05	0.05	0.05	0.05
477115	Fly Wheel Bolt.....	2.55	2.55	2.55	2.55
477116	Ball and Socket Joint.....	1.15	1.15	1.15	1.15
477117	Oil Cup.....	1.10	1.10	1.10	1.10
477118	Nut for Connecting Rod Bolt.....	0.05	0.05	0.05	0.05
477119	Injector Body Seal Nut.....	0.05	0.05	0.05	0.05
477120	Nut for Fly Head and Base Cap Stud.....	0.05	0.05	0.05	0.05
477121	Nut for Throttle Stem.....	0.05	0.05	0.05	0.05
477122	Locknut for Base Cap Stud and Cam Gear Pin.....	.05	.05	.05	.05
477123	Nut for Ball Joint.....	0.05	0.05	0.05	0.05
477124	Lock Washer for Cam Gear Stud.....	0.03	0.03	0.03	0.03
477125	Set Screw for Fuel Cup.....	0.03	0.03	0.03	0.03

PARTS NOT ILLUSTRATED

Part No.	Name of Part	HORSE-POWER			
		1 1/2	2 1/2	5	7
477130	Speed Changing Dowel.....	10.06	10.06	10.06	10.06
477131	Speed Changing Dog Spring.....	0.05	0.05	0.05	0.05
477130A	Oil Guard Cap Screw.....	1.10	1.10	1.10	1.10
477132	Governor Speed Changing Washer.....	0.08	0.08	0.08	0.08
477126	Cylinder Head Complete with Valves and Springs.....	5.00	9.85	12.95	14.65
477127	Dr in Cock for Water Reservoir.....	5.50	8.50	8.50	8.50
477128	Governor complete.....	5.30	8.00	8.00	8.00
477129	Water Reservoir Gasket.....	2.25	3.00	3.00	3.00
477130	Cylinder Head Gasket.....	.53	2.55	.80	1.35
477131	Cylinder Head Drain Cock.....	2.50	5.00	5.00	5.00
477132	Muffler, complete.....	1.88	2.78	3.38	3.68
477133	Fly Wheel Key (pulley side).....	.12	.12	.15	.15
477134	Collar for Intake Valve.....	.08	.05	.05	.05
477135	Cylinder Cap Screw.....	.18	.15	.15	.20
477136	Water Reservoir Bolt.....	1.10	1.10	1.10	1.10
477137	Machine Bolt for Pulley.....	1.10	1.10	1.10	1.10
477138	Nut for Exhaust and Intake Valve Stem.....	.05	.05	.05	.05

Note:—All items marked (*) will be shipped by express or freight, not prepaid. All other parts are shipped by parcel post, postage paid by us.

IF THE WATER BOILS.

Do not be alarmed if the water gets so hot that it boils. The cylinder is cooled by the water circulating around it, and the heat passes off in the form of steam. Keep the cylinder properly lubricated, the reservoir full of water and there will be no danger of your engine overheating.

IF THE ENGINE POUNDS WHEN STARTING.

If your engine fails to start as described on page 3 and you prime the engine, there is an excess of fuel in the fuel cup in the cylinder, and the engine will pound for one or two minutes. There is no danger in connection with this, and if you will be careful and not prime the engine too much, this pound will not occur. It does not indicate an early spark because this engine is not equipped with a spark, but simply indicates an excess of fuel, and as soon as this excess of fuel is used up, the pound will disappear.

This pound can be relieved by holding open the intake valve by means of the relief lever "H" (see page 3); this will blow the excess fuel out through the intake port; you need only hold this valve open while the engine makes three or four revolutions and then allow the valve to close, and the engine will continue to run without pounding.

BE SURE TO KEEP THE BEARINGS TIGHT.

The three bearings on the crankshaft are fitted with steel liners, so you can take up the wear. To take up the wear, remove the bearing cap and take out enough of the liners, an equal amount on each side, until the bearing fits snugly. Be careful not to get the bearings too tight. Open the relief valve and turn the flywheels around by hand to see that they turn freely. A bearing should never be too tight or too loose. It must fit snugly. Watch the grease cups closely and give them a full turn each time you start the engine.

REPACKING CYLINDER HEAD.

If it is ever necessary to repack the cylinder head, be sure to use the special packing as shown under No. 47159 on page 9.

CARE OF INLET AND EXHAUST VALVES.

Oil the valve stems occasionally and keep the springs clean. If necessary to grind the valves, remove the cylinder head and take off the valve springs. Wash the valves and their seats with gasoline; then make a paste of fine emery dust and oil, or powdered pumice stone and oil. Smear this on the valve and seat, put the valve in place; then put a nail through the hole in valve stem on the outside of the head; grasp the nail with your fingers, and while pulling out on the valve, turn from left to right for a minute or so; then lift the valve, turn it about half way around and repeat the operation until the valve and seat show an even, polished surface all the way around. Remove all emery dust with gasoline. In replacing springs, put the heavy one on the valve that is operated by the lever, and the light spring on the other one.

TO REMOVE GOVERNOR BALLS, SPINDLE OR PINION.

Hold the flywheels stationary to lock the gears; then take a wrench and while standing on the governor side of the engine, turn the governor balls to the right.

REPLACING CAM GEAR.

If it is ever necessary to take off the cam gear, as illustrated in Figure 8, be very careful in putting it back on, as this gear controls the entire operation of the engine.

To put on the cam gear, turn the flywheels around until the key in the crankshaft is straight up, as shown by "B"; then set the two teeth that are just under indicator "A" on the cam gear, over the one tooth above the key "B." Then roll the cam gear around to the right until it reaches the position as shown by the dotted gear, being sure to keep the gear teeth together; then slip the cam gear pin in place and fasten it with lock washer and nut.

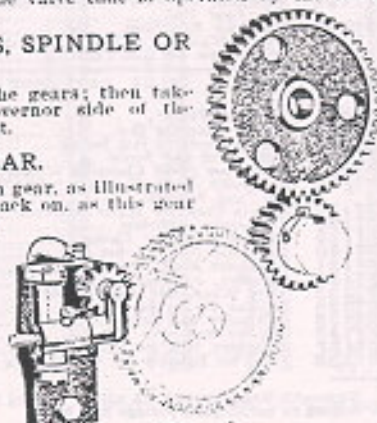


Figure 8.

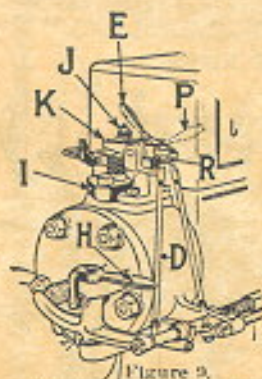


Figure 2.

IF YOUR ENGINE FAILS TO START.

FIRST: See that there is fuel in the tank and that it flows freely by priming the engine as instructed on page 2. Then if the engine fails to start, it may be necessary to remove the fuel body and clean it. (See below); do not do this until you have tried the following:

SECOND: Try the compression; there may be a leak at either the intake or the exhaust valve, and if you will work these valves back and forth and also rotate them on their seats, you can undoubtedly remove any small bit of carbon or foreign matter that has lodged on the valve. If this does not remedy the trouble, you may have to regrind these valves (see page 10). It is necessary that the compression be good at all times.

THIRD: The compression may escape past the piston and it will be necessary to remove the piston and clean the rings. (See page 12.)

IF ENGINE RUNS TOO FAST OR TOO SLOW.

If the needle valve "J" should get out of adjustment in any way, the engine would run too fast or too slow. In order to adjust this valve, move the speed lever "E" to the right as far as it will go, as shown by "P." Loosen the locknut on needle valve "J"; hold the knurled nut from turning and screw down the needle valve until it seats and then tighten the locknut.

IF ENGINE RUNS IRREGULARLY OR STOPS FREQUENTLY.

If the fuel valve leaks, the engine will operate irregularly under load and will stop frequently. Remove the fuel body (see below), take off the fuel cup and push the fuel valve open, and if the fuel seat is black, it has been leaking, and should be reground (see below). If it is bright it does not require attention. In grinding this valve be sure a seat is formed below the small hole through which the fuel is admitted.

HOW TO REMOVE FUEL BODY.

To remove the fuel body "I," take out the two cap screws that hold the bracket that carries the speed lever and swing this bracket out of the way (it is not necessary to disconnect any rods in order to do this), disconnect the fuel pipe and remove the two nuts on top of the fuel body and lift it out. Take out screw on side of fuel cup and remove the cup.

Clean the cup, also be sure that the two small holes are not clogged up; if they are, soak in kerosene and clean them out with a pin. Replace the cup, being sure the copper basket is in place and put the fuel body in the engine as before. [Do not screw nuts down too tight, as fuel body does not fit down tight on cylinder head.]

HOW TO GRIND FUEL VALVE IN FUEL BODY.

A leak in the fuel valve might also cause trouble. To see if this valve leaks, when you have the fuel body out of the engine, remove the fuel cup, pour a little kerosene into the street oil, hold the fuel body in the same position as it would be when on the engine, and see whether any kerosene runs out around the valve. If it does, then the valve leaks and should be reground.

To regrind this valve, push it off its seat and put a little fine emery sand and oil or fine grinding compound on the outer edge of the valve next the seat. Let go of the valve, then take a screwdriver and turn the valve back and forth a half turn each way, lifting the valve off its seat occasionally and giving it a half turn so as to grind it in evenly all the way around.

Keep the grinding compound as near the outer edge of the seat as possible, because the largest diameter of any valve grinds quickest, and it is most important that this valve should be tightest at its outer edge. **USE ONLY THE FINEST EMERY OR GRINDING COMPOUND,** and wash all parts carefully with kerosene so as to take off any of the grinding material.

HOW TO ADJUST THE FUEL VALVE.

The fuel valve "K" should begin to open just after the piston reaches the inner end of the cylinder and starts out on the suction stroke, and it should close just before the piston reaches the open end of the cylinder. The opening and closing point in this valve may be adjusted by lengthening or shortening the rod "D" by loosening the locknut "R" and screwing the rod in or out of the ball joint

connector. Lengthening this rod causes the fuel valve to open earlier and close later; shortening the rod causes the fuel valve to open later and close sooner. After adjusting, be sure to tighten the locknut "R."

HOW TO CLEAN PISTON AND RINGS.

It may be necessary to remove the piston and to clean it and the rings. Feeding a poor grade of lubricating oil would cause a carbon deposit to form on the rings, and in time will bind them in the grooves.

To remove the piston from the cylinder, take off the fuel tank and the oil guard and remove the connecting rod bolts on the crankshaft. Next you will have to take off the governor spindle as instructed on page 10; after you have done this, the piston will slip out of the cylinder.

If the rings are gummed in the grooves, wash the piston and rings thoroughly with kerosene, and you may have to scrape off the carbon at the end of the piston and in the ring grooves with a knife.

To remove the rings, take three thin metal strips (pieces of an old back saw blade are fine for this) and slip under the center ring. Start the first strip under the ring at the joint and force it all the way around until you have it in the position shown by "A" in Figure 10, then slip the second strip to "B" and the third to "C," which will raise the ring out of the groove so that it can be slipped off; in replacing the rings put the center ring on first and then the other four.

Before putting the piston back in the cylinder, oil the rings and surface of the piston thoroughly.

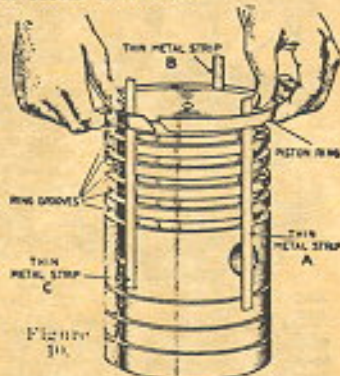
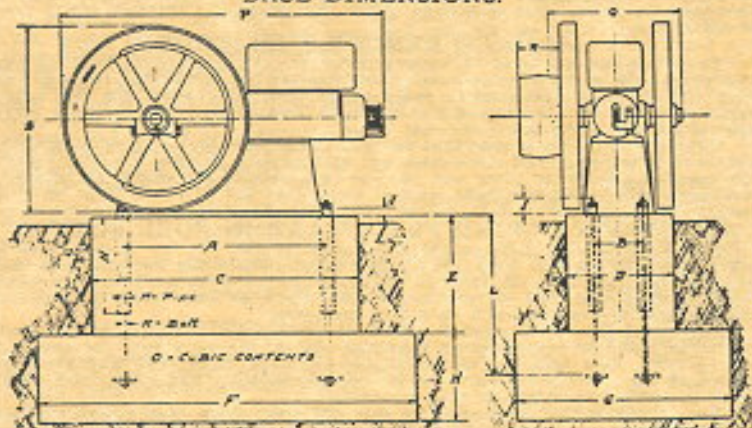


Figure 10.

BASE DIMENSIONS.



ENG	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
11NP	20	58	25	14	12	41	24	12	12	2	2	18	1	10	102	382	228	4	18
22NP	25	61	36	18	18	48	30	12	22	12	2	24	1	15	162	592	216	4	22
5NP	29	6	42	20	18	56	34	12	22	12	2	24	12	15	22	462	242	4	28
7NP	36	7	48	20	18	64	38	18	22	12	2	27	12	15	36	542	242	6	34
9NP	41	10	54	22	24	77	44	18	22	12	2	32	12	20	52	642	282	8	38